OUTREACH SCREEN

Field of the Invention

THIS INVENTION relates to an up-and-over screen assembly, and is more specifically, although not exclusively concerned with such an assembly having a screen that can be moved between a first position at which it stands almost vertically, or vertically alongside the lower portion of spaced upright tracks, and an elevated position at which the screen extends approximately at right angles to the tracks to protect an area beneath the screen from ambient conditions such as rain, hail or direct sunlight. The screen is moved between its two positions by lifting a traveller or travellers along respective upright tracks which may be provided by vertical guides or other means. The screen is guided during its movement between its two operating positions by one or more rigid links. The upper end of each link is pivoted at a location fixed with reference to the upper end of the track so as to turn about a horizontal first common axis, and the link slopes downwards to a second location at which it is attached to the screen to turn about a second pivotal axis which is parallel to the first pivotal axis. One example of such an up-and-over screen assembly is described in detail and illustrated in the specification of my co-pending international published patent application No. WO 03/040490 A1 hereby inserted by way of reference.

The advantage of an up-and-over screen is that the area that is shielded from above by the screen, is not physically traversed during movement of the screen between its two positions. Thus, for example if the screen is being used as protection for a carport, the car does not have to be moved out of the carport before the screen can be raised or lowered.

State of the Art

There are circumstances in which the screen is required to intercept sunlight during extended periods when the sun is following its arc of movement across the sky. When the sun is approaching the two ends of its movement, protection from its rays ideally requires the screen to occupy two mutually-transverse planes, respectively, both of

which are inclined with respect to a vertical plane containing the track or tracks so that one of the screens slopes upwardly from the common vertical plane while the second screen slopes downwardly from the vertical plane. For the screen sloping downwardly from the vertical plane, the traveller is located beneath the second of said pivotal axes. As long as the traveller is located in this position, the stiffness of a frame, normally used to support the screen, provides a downwardly-inclined strut transmitting the weight of the screen downwardly and extending between the screen and the traveller. The downward force acting through the strut resists the turning movement of the weight of the screen about the upper end of the track and which urges the screen to flatten itself against the track. The screen position can thus be accurately controlled by the position of the traveller as long as it is sloping down away from the common vertical plane.

However, if the screen is to slope upwardly away from the common vertical plane the stiffness of the screen frame no longer provides an effective strut opposing the turning moment referred to above. As a result, an element of instability can occur in the ability of the traveller to position the screen correctly. Such instability can easily cause collapse of the screen against the track, or damage its operating mechanism, or even cause personal injury. For this reason the up-and-over non-folding screens currently proposed, only move the screen through about ninety degrees or less, from the lowered vertical position to the raised horizontal position. As they only allow the screen to move through an angle not greater than about ninety degrees they avoid the above-mentioned instability from occurring. For this reason the advantage of having a screen moveable between two mutually transverse planes and referred to above, is lost.

Object of the Invention

An object of this invention is to provide an improved up-and-over screen.

The Invention

In accordance with the present invention an up-and-over screen assembly has at least one track for a traveller, a stably-supported screen fixed at one side to the traveller which is moveable up and down the track respectively to raise and lower the screen

through more than ninety degrees between a lowered upright position alongside the track and a raised position at which the screen extends transversely from the track to shield a chosen ground area adjacent the track from a particular ambient condition, at least two rigid links rotating at their ends about parallel horizontal first and second pivotal axes to guide movement of the screen between its raised and lowered positions, the first pivotal axis being fixed in relation to the upper end of the track and the second pivotal axis being fixed in relation to the screen, and, a device positionally fixed in relation to the screen assembly and for absorbing unwanted forces which would otherwise act on the traveller to cause the screen to become unstable when raised through approximately ninety degrees or more.

Preferred features of the Invention

In one arrangement the device provides a resilient bias that is controllable. The bias does not have to increase with the upward movement of the traveller close to the level of the second common axis. This may be achieved by having the device positioned above the traveller and suitably designed as a gas or hydraulic strut conveniently located in the upper end of the track so that it is engaged by the traveller as it approaches a position at which the screen is horizontal or nearly so.

In another screen assembly the device comprises a high ratio speed-reduction gear box disposed between a drive unit which controls the position of the traveller on the track, and an inextensible drive loop connecting the traveller to the output side of the gear box. The ratio of the gearbox is sufficiently large, and it is of sufficient mechanical strength, to prevent the load on the drive loop reversing the drive direction of the drive unit. Thus at all times the position of the traveller is positively determined by the drive unit.

If the screen is of extended length it may be operated by two or more travellers respectively moveable in synchronism along parallel upright tracks.

In the preferred arrangement of the invention the screen assembly has two independently moveable screens respectively arranged one on each side of two masts respectively providing two tracks. The masts may have pivotal connections arranged adjacent their upper ends and to which are attached the upper ends of two links respectively extending down to a respective screen. Each screen can be moved independently between a stowage position at which it is arranged in a vertical or general upright plane, alongside the masts, and an operating position at which it extends transversely from the plane of the masts and slopes upwards or downwards from the masts.

Introduction fo the Drawings

The invention will now be described in more detail, by way of an example with reference to the accompanying diagrammatic drawings, in which:-

In the Drawings

FIGURE 1 shows in a perspective view a screen assembly having two separately-moveable planar screens respectively gently sloping downwardly away from one another in order to shield a relatively large ground area from overhead conditions, such as rain or sun;

FIGURE 2 is a view taken from one end of figure 1 and shows the right-hand screen positioned in a sloping plane substantially parallel to but spaced from another sloping plane containing the left-hand screen;

FIGURE 3 shows the right-hand screen at a position it occupies during movement towards its stowage position when it lies in a vertical plane against two masts;

FIGURE 4 shows to an enlarged scale and partly broken away, an end-view of the assembly with the right-hand screen shown in its stowage position, and the left-hand screen being elevated and being shown only in part, this figure showing in

more detail the positions of components of the assembly used to guide movement of the screens and to locate them it in their elevated and stowage positions;

FIGURE 5 is a broken-away, detailed, explanatory vertical section of a part of figure 4 and shows a latch plate and associated stirrup used to hold a screen in its stowage position on one side of a mast, and a gas strut which is compressed by vertical upward movement of a carriage along the mast, the carriage being fixed to an associated traveller; and,

FIGURE 6 is a cross-section through figure 5 taken on the line and in the direction indicated by the arrows - VI – VI in figure 5.

Description of Preferred Embodiment

Figure 1 shows a screen assembly 1 comprising two spaced parallel masts 2,3 having their lower ends set into a solid foundation and spaced approximately three metres apart. Each mast comprises a central cylindrical steel pole 4 having brackets 5 which attach to diametrically opposite sides of the pole respective channel shaped guide rails 6 and 7. The two masts 2,3 are attached at their upper-ends to a skeletal framework 10 (not shown in detail) which extends horizontally beneath a canvas canopy 8.

As shown in figure 6, each of the guide rails 6,7 is provided with an outwardly-directed vertical slot 29 that leads into a channel 21 and is defined between the opposed edges of two inwardly-directed lips 11 provided at the entry to the channel. A roller carriage 9 shown in more detail in figure 5 is mounted for vertical movement in an upright track the channel 21 of each of the guide rails 6,7. An attachment plate 28 fixed to the carriage 9 extends through the slot 29 in the guide rail and provides part of a traveller 26. The end of the plate 28 protrudes from the slot 29 and is held between the arms of a clevis 12 which is pivoted to the plate by a horizontal pin 13.

Referring back to figure 1, the screen assembly 1 shields the ground area beneath it from ambient conditions, by means of two screens 14,15. Each screen comprises a

strong rectangular light tubular metal frame 16 reinforced on its upper surface as shown in figure 1, by a pair of horizontal tubular, stiffening bars 19. Further stiffening is provided by three spaced parallel metal pipes 17, attached to the frame 16 by suitably-shaped brackets (not shown). As shown in figure 1 the two outermost pipes 17 carry fixtures 18 on their upper surface intermediate their ends for the attachment of the lower ends of pivotal links 22,23.

The frame 16 is spanned by an air-permeable thin layer of thin parallel reeds or canes 20 which gives protection from the sun above. The canes are attached at their ends to the frame 16. Horizontally extending thin, overlapping sheets of pliant polycarbonate (not shown) may be attached to the upper surface of each of the screens 14,15 to prevent water passing through them. The overlap of the sheets and the permeable nature of the reed or cane layer, allow air to flow upwardly through the screen so that any differential air pressure which might otherwise cause the screens to lift bodily, is dissipated before damage to the assembly can occur. Additionally the space beneath the screen remains cool as hot air can convect upwardly through the cane or reed layer.

Movement of each of the screens 14, 15 to its different operating positions is guided in part by one of the pairs of parallel rigid links 22, 23. These links are each pivoted at their respective ends to parallel horizontal pivotal axes. The links 22,23 are attached at their upper-ends to the skeletal framework 10 at positions directly above the centre lines of the poles 4 of the respective masts 2,3. The upper pivotal axes for the links 22, 23 are provided by respective co-axial pivot bolts 24 extending horizontally as is clearly shown in figure 4.

The lower ends of the links 22, 23 are respectively connected to the two attachments 18 provided on the outermost stiffening pipes 17 of each screen as shown in figures 1 and 3. These attachments provide coaxial pivotal points to which the lower ends of the links 22 and 23 are connected. The links of each screen always move in synchronism and parallel to one another.

Vertical movement of the travellers 26 controls the vertical positioning of the screens 14,15. As shown in figure 4, the travellers 26 are lifted by inextensible cables 30 which are attached at their lower ends to the traveller 26. The upper-ends of the cables 30 are coiled around one of two, axially parallel, cylindrical pulleys 31 located beneath the canopy 8 as shown in figure 4. The two cylindrical pulleys 31 each carry at axially spaced positions the convolutions of the cables 30 of one of the screens 14, 15 and can be independently rotated by their own drive motors (not shown). As the pulleys 31 are identical, rotation of either of them causes the two cables 30 associated with them to move in synchronism and alter the positions of the two travellers 26 of the associated screens.

In the example being described, the direction of rotation of the electric motors controlling the rotation of a corresponding pairs of pulleys 31, is remotely controlled by a hand-operated unit (not shown) that is provided with the screen assembly. However, the use of an electric motor to control the rotation of a pair of pulleys may be replaced by a manual drive, if preferred.

A horizontally-extending rectangular stirrup 40 of stiff wire shown in figures 5 and 6 is provided towards the upper-end of each of the masts 2,3 as shown in figure 4, the loop of the stirrup extending horizontally towards the upper portions of the respective screens 14,15 when in their stowage positions. Each screen is provided with two latch plates 41 as shown in figures 4 and 5 which are respectively fixed to the outer ends of the outermost of the stiffening pipes 17 on each screen. The latch plate 41 is shaped to provide a claw 42 which latches over the associated stirrup 40 when the associated screen is in its vertical stowage position as shown in the right-hand portion of figure 5. The claw 42 forms the upper-end of an entry slot 43 on the latch plate 41 and the stirrup 40 is guided into the slot 43 as the screen approaches its stowage position, by upper and lower ramp surfaces 44, 45 which respectively lead into the slot 43. The final descent of the screen to its vertical stowage position during lowering, involves a turning movement of the upper-part of the screen towards the masts 2, 3, and a lowering movement of the screen caused by downward movement of its two travellers 26. The

parts are so arranged with respect to one another that during this final descent of the screen, the entry slots 43 of its two latch plates 41 assume a horizontal position directly opposite the associated stirrups 40. The turning movement of the screen about the lower ends of the links 22, 23 causes the stirrups 40 to enter the slots 43 and to assume positions beyond the down-turned ends of the claws 42. The terminal part of the descent of the screen causes the stirrup 40 to latch behind the claw 42 and thus retain the screen in a position at which it lies in a plane parallel to the vertical plane containing the two masts 2,3, as illustrated in figure 4. The links 22, 23 slope downwardly towards the screen from their upper-ends so that, during subsequent lifting of the screen by the two associated travellers 26, the latch plate entry slots 43 are first raised to the level of the stirrups 40 and the increasing inclination of the two links 22, 23 away from the vertical, together with the inclination of the ramp surface 45, forces the upper-end portion of the screen outwardly about the lower ends of the links 22,23. Simultaneously the latch plates 41 disengage from their respective stirrups 40. Further lifting of the screen can then take place to alter its plane from a vertical position alongside the masts 2,3 to a horizontal position at which the screen extends approximately at right angles from the upper-end portions of the masts 2, 3 as shown in figure 1.

As is shown in figures 5 and 6 a vertical gas strut 60 is provided inside the upper-end portion of each of the guide rails 6 and 7 and is adjustable to provide a desired compressive resistance. A piston 61 of the strut 60 extends downwardly and terminates in a head 62 which is engaged by the carriage 9 of the associated traveller 26 when the screen is lifted towards a position at which it is almost horizontal. Such engagement occurs immediately prior to the screen becoming horizontal, and thus the lifting force of the traveller 26 by the associated cable 30 encounters an additional resistance generated by the gas strut 60, as the carriage 9 approaches the upper-end of its movement. The resistance created by the gradual upward compression of the strut 60 prevents any tendency of the screen to collapse uncontrollably against the masts 2,3. The increase in the resistance offered by the gas strut 60 is chosen to match the reduction in load on the cable 30 as the screen moves upwards to and through the horizontal position. The load on the cable 30 is thus maintained sensibly constant and the cable is, of course, made

from an inextensible material. The struts 60 thus enable each screen 14, 15 to move between elevated positions it slopes upwardly or downwardly from the masts 2,3 without loss of control. The two screens can thus be arranged to provide a larger and more effective area of protection from above against sunlight or rain, than can be achieved by a single screen of similar area.

Modifications of the Preferred Embodiment

Various modifications to the above-described example of the invention are possible. For example, the gas strut may be replaced by a mechanical spring mounted inside an enclosure attached to either the upper or lower end of each mast. The spring is then arranged to introduce a thrust during terminal part of the lifting of the associated traveller to a position at which the screen is nearly horizontal. The mechanical tensioning (or compression) of the spring is chosen to compensate for the reduction in downward forces on the travellers which occur when the screen passes through its horizontal elevated position and which would otherwise cause the positioning of the screens 14, 15 to become unstable.

In a further modification, the cable 30 is replaced by an inextensible loop made, for example, from a Reynolds chain, which is connected at its two ends to a traveller and passes around gear wheels at the upper and lower ends of the associated track. One of the two gear wheels is driven by an electric motor or manually, by way of a high-ratio drive transmission mechanism such as a gearbox or a leadscrew. The high ratio is so chosen that it is incapable of transmitting drive in the reverse direction. Thus the drive applied to the driven gear wheel precisely controls the position of the associated traveller as it moves up and down the track and travels through the zone where instability would otherwise occur.

Although the example of the invention shown in the drawings describes in detail two independently moveable screens, the invention is equally applicable to a single screen supported by two or more travellers running along respective upright parallel upright tracks, and in particular to a pair of screens of extended length arranged alongside a

path on the ground which is to be protected from overhead ambient conditions such as sunlight or rain. When the screens are lowered into the vertical plane, they provide privacy between opposite sides of the screens. By raising the screens to their vertical positions they can be used to protect the areas beneath them from overhead inclement weather conditions. Such an arrangement is particularly well-suited to an outdoor restaurant where the screens can be mounted on masts arranged in a line passing between two rows of tables.

In some situations, it is required to use a screen of the invention to protect a path extending alongside a wall, from adverse weather conditions. A typical use is in conjunction with a carport. The upright parallel guide rails providing tracks along which the travellers of the screen move, are suitably vertically set into the wall at spaced intervals. The stowage position of the screen is then vertical, alongside the wall. Lifting of the screen to a horizontal position results in it extending above the carport to provide overhead protection for a car standing in the carport. Such movement does not require the car to be driven from the carport before it can take place.

A further usage of a two-screen assembly as shown in the example of the invention specifically described above is to provide a cabana-type structure. One of the two screens can be arranged horizontally to provide a roof to the cabana and the other screen can be arranged in its verticalstowage position at which it provides a back wall to the cabana. One can envisage such a use of the invention as being particularly appropriate in the vicinity of a private swimming pool when it will provide shade from above and privacy from behind. The direction of opening of the cabana can be easily changed, if a wind reversal occurs, by interchanging the vertical and horizontal positioning of the screens.